

CHEMICAL WEED CONTROL FOR FIELD CROPS

Plant-back Interval for Fall, Pre-Plant, and PRE Herbicides

	Rate/A ^a	See paragraph	Alfalfa	Barley	Canola	Chick pea / Lentil	Corn	Dry bean	Field pea	Flax	Oat	Potato	Safflower	Soybean	Sugarbeet	Sunflower	HRS / Durum Wheat
----- months before planting (d = days) -----																	
2,4-D ⁴ amine	0.5 lb ai	B3	1	0	1	1	7d	1	1	1	1	1	1	15d	1	1	0
	1 lb ai	B3	1	0	1	1	14d	1	1	1	1	1	1	1	1	1	0
2,4-D ⁴ ester	0.5 lb ai	B3	1	0	1	1	7d	1	1	1	1	1	1	7d	1	1	0
	1 lb ai	B3	1	0	1	1	14d	1	1	1	1	1	1	1	1	1	0
E-99 / Weedone 650 ⁴	1 lb ai	B3	1	0	1	1	14d	1	1	1	1	1	1	15d	1	1	0
Aim ¹⁴	0.5 to 1 fl oz	B4	0	0	0	0	0	0	0	0	0	0	N/R	0	N/R	0	0
Afforia ^{2,2,14*a}	2.5 - 3.75 oz		3-4	3-4	4-12	4-12	.5-1	3-4	3-4	3-4	4-5	4-12	3-4	1-7d	4-10	45d	1-2
Alluvex ^{2,2}	1.5 oz		18	9	18	18	0	10	10	10	9	1	18	10	18	10	9
Anthem Flex ^{14,15}	2.5 - 4.5 fl oz	D6	10	11	18	6	0	11	6	18	11	4	18	0	12	4	1
Autumn Super ^{2,2}	0.5 oz	B5	Apply post-harvest in fall and plant only corn the next spring.														
Banvel/DMA ^{4*a}	1 pt	B6	NCS	3d/oz	NCS	NCS	0 ^a	NCS	NCS	NCS	3d/oz	NCS	NCS	45 d	NCS	NCS	3d/oz
	1 to 2 pt	B6	NCS	NCS	NCS	NCS	0 ^a	NCS	NCS	NCS	NCS	NCS	NCS	90 d	NCS	NCS	3d/oz
Boundary ^{5,15}	2 - 3.5 pt		4.5	8	12	8	12	12	12	8	12	0	12	0	18	12	8
Clarity/DGA ^{4*a}	8 fl oz	B6	4	22 d	4	4	0 ^a	4	4	4	22 d	4	4	4	4	4	22 d
	16 fl oz	B6	6	44 d	6	6	0 ^a	6	6	6	44 d	6	6	6	6	6	44 d
Dual Magnum ¹⁵	1 - 2 pt		4	4.5	12	0	0	0	0	12	4.5	0	0	0	0	0	4.5
Elevore	1 fl oz		9	14d	14d	9/15	14d	9	9	9	14d	15	9	14d	15	14d	14d
Express / tribenuron ^{2*} Labeled rates			1.5	0	2	1.5	.5-2 ^a	1.5	1.5	1.5	1.5	1.5	1.5	7d ^{ac}	2	0-2 ^{ae}	0
Facet 4L ^{4,26}	22 fl oz	B10	24b	10	10	24b	10	24b	24b	24b	10	24b	24b	24b	24b	24b	0
Fierce ^{14,15}	3 oz		10	11	18	11/6 ^a	7d-1 ^a	11	6	18	11	4	18	0	15	4	1
Glyphosate ^{9*}	0.75 - 3 lb ae	B2,8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harmony/thifensulfuron ^{2*} Label rates		E5	1.5	0	1.5	1.5	0	1.5	1.5	1.5	0	1.5	1.5	0	1.5	1.5	0
Liberty ¹⁰	32 - 43 fl oz	B9	6	70d	0	6	0	6	6	6	70d	70d	6	0	0	6 ^a	70d
Paraquat ^{22*} - RUP	Label rates	B11	0	0	N/R	N/R	0	0	0	N/R	N/R	0	0	0	0	0	0
Pre-Pare ²	0.3 oz	C7	24	9	9	24	11	9	11	9	11	9	9	9	9	9	0/4
Quelex	0.55 - 0.75 oz		9	0	9	9/15	3	9	9	9	3	15	9	3	15	3	0
Select/clethodim ^{1*}	4 - 16 fl oz	E2	0	1	0	0	6d-1 ^a	0	0	0	1	0	0	0	0	0	1
Sequence ^{9,15}	2.5 - 3.5 pt	A4	4	4.5	NCS	0	0	0	0	0	4.5	0	NCS	0	NCS	0	4.5
Sharpen ¹⁴	1 fl oz	B12	4	0	4	0	0	4	0	4	0	4	4	0 ^f	4	4	0
	1.5 fl oz	B12	5	0	5	0/1	0	5	0	5	0	5	5	14d ^f	5	5	0
	2 fl oz	B12	5	0	5	0/1	0	5	0	5	0	5	5	1 ^f	5	5	0
	3 fl oz	B12	6	0	6	2/3	0	6	2	6	0	6	6	2 ^f	6	6	NR
Spartan Charge ^{14,14}	3 - 10.2 fl oz	E11	12	4	24	0	4	0	0	12	12	4	12	0	24b	0	4
Valor ¹⁴ + tillage	2 oz	E12	4	3	4	3/6	7d-1 ^a	3	3	3	4	4	3	0	4	1 ^a	14-1d ^a
- tillage	2 oz	E12	8	3	8	3/6	7d-1 ^a	3	3	3	8	8	3	0	8	1 ^a	14-1d ^a
+ tillage	3 oz	E12	5	4	6	4/7	14d-	4	4	4	5	5	4	0	5	2 ^a	2 ^a
- tillage	3 oz	E12	10	4	12	4/7	14d-	4	4	4	10	10	4	0	10	2 ^a	2 ^a
Verdict ^{14,15}	5-18 fl oz	B12	NCS	NCS	NCS	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	0-4	NCS	NCS	NCS
Zidua SC ¹⁵	1.75 fl oz	D6	10	11	12	1	0	11	1	2	11	4	1	0	12	1	1
	3.25 fl oz	D6	10	11	12	1	0	11	1	4	11	4	1	0	12	2	1
	5.00 fl oz	D6	10	11	15	1/2	0	11	1	6	11	4	1	0	15	3	4
	6.50 fl oz	D6	10	18	18	2/4	0	11	2	8	18	4	2	4	15	3	6

*= Or generic equivalent.

Herbicide name^{number 1-30} = herbicide site of action - see pages 108-109.

^a = Refer to label for approved rates and restrictions.

^b = bioassay

^c = Soybean = 1 day before planting at 0.25 oz SG
= 7 days before planting at 0.3 to 0.5 oz SG

^d = days before planting

^e = ExpressSun sunflower = 0 days at 0.25 to 0.5 oz SG

^f = Soils must be medium to fine texture with >2% OM.

NCS = Next Cropping Season; NR = Not Registered

Actual glyphosate product rates based on acid equivalent (ae) and active ingredient (ai) formulation concentrations - Refer to page 4 for more information.
0.75 lb ae 1.125 lb ae 1.5 lb ae 2.25 lb ae 3 lb ae

lb ae	lb ai	fl oz/A				
3	4	32	48	64	96	128
3.75	5	25.6	38.4	51.2	76.8	102.4
4	5.4	24	36	48	72	96
4.17	5.1	23	34.5	46	69	92.1
4.5	5.5	21.3	32	42.6	64	85
4.72	6.3	20.3	30.5	40.7	61	81.4
5	6.1	19.2	28.8	38.4	57.6	76.8

Fall-Applied / Early Preplant Herbicides

B1. FALL APPLICATION - HERBICIDES

Several herbicides may be applied in the fall. Some include acetochlor, Eptam, Far-Go, S/metolachlor*, Ro-Neet, Prowl, Sonalan, Spartan, and Treflan*. Optimum activity occurs when herbicides are applied in late fall during consistent cold temperatures (below 50 F) to reduce degradation and winter moisture provides adequate activation for residual spring weed control. Application after October 15, when soil temperature is cold, minimizes herbicide loss by volatilization and microbial and chemical degradation. Many labels recommend application after October 1 or 15. Some herbicides, such as Eptam, Far-Go, and Ro-Neet, require immediate tillage for incorporation while many do not require tillage for incorporation. Some herbicides, such as Sonalan, can be incorporated with a V-blade plow or undercutter. Acetochlor, S/metolachlor, Eptam, and Spartan fall-applied may give poor weed control in spring because of warmer than normal weather between application and spring seeding which causes insufficient residual activity.

Both granular and liquid formulations of herbicides are registered for use in fall. Fall applied, granular herbicides usually give more effective weed control than the liquid formulations, especially under heavy crop residue situations. Research at NDSU with fall application of Far-Go indicates that, at similar rates, granular formulations performed more effectively than the liquid formulation but fall surface-applied Far-Go gave less consistent weed control than when fall incorporated.

B2. FALL APPLICATION - WEED CONTROL

Fall is an effective time to control winter annual weeds, simple perennials such as curly dock and dandelion, biennials such as biennial wormwood, and in some cases cool-season perennial weed species. This is especially true for no-tillage fields, but also for those fields receiving tillage other than moldboard plowing. For fields in which tillage is planned, apply POST herbicides at least 5 days prior to tillage. Herbicides may be applied within a few days of crop harvest or until the soil is frozen. The most consistent and effective control of dandelions is obtained with fall herbicide applications. Seed production of winter annual species can be prevented with fall herbicide applications or effective fall tillage. Apply herbicides in the fall under less than ideal conditions will give greater weed control, including dandelion rather than postpone until spring.

The most effective fall and spring herbicide treatment with the most cropping flexibility is glyphosate at 0.75 pound ae/A + 2,4-D ester* at 0.5 lb ai/A + Express at 0.33 oz DF/A or 0.5 oz SG/A. The addition of 2,4-D* is most important for dandelion control but will antagonize Canada thistle and perennial grass weed control from glyphosate.

Another herbicide option is the addition of Valor (flumioxazin) at 2 to 4 oz/A to the glyphosate plus 2,4-D* mixture. Valor is a residual PRE herbicide that controls many broadleaf weeds. Valor applied with glyphosate improves control of many small broadleaf weeds but the rapid contact action may antagonize control from glyphosate on larger and less susceptible weeds.

Fall applications that include Valor will be most beneficial west of the Red River Valley where spring rains may not be sufficient to activate Valor. Fall and winter moisture will activate Valor even in the drier areas of the state. Preliminary studies with fall-applied Valor have shown potential to control or suppress weeds such as kochia, seedling dandelion, canola, and chamomile. Valor should only be applied in no-tillage fields and any substantial soil movement next spring during planting will reduce the effectiveness of Valor on spring emerging weed species.

Refer to the Valor label for crop rotation guidelines for fall applications. Most crops can be planted in the spring following fall-applied Valor.

B3. 2,4-D plus glyphosate applied as a preplant application up to emergence of small grains has been considered safe as shown by university research. Within 29 days after an application of 2,4-D, plant only those crops listed on the 2,4-D label. Most 2,4-D labels list corn, soybean and small grains as registered. However, corn and soybean have more specific limitations for preplant use. Labeled crops may be at risk of crop injury or loss if planted soon after application, especially during the first 14 days. Risk is greater if higher rates of product were applied and soil temperatures have been cold and/or soils have been excessively wet or dry in the days following application. Under normal conditions, any crop can be planted without risk of injury if at least 90 days of above freezing soil temperatures have elapsed since application. Amine formulations have a longer residue and are more water soluble than ester formulations. As a consequence, amine residue will last longer in the soil and can leach with rain injuring germinating seedlings of broadleaf crops.

For soybean, delay planting:

7 days for 1 pt (0.5 lb ai)/A 2,4-D ester
15 days for 1 pt (0.5 lb ai)/A of 2,4-D amine
30 days for 2 pt (1 lb ai)/A of 2,4-D amine or ester
15 days for 1.33 pt (1 lb ai)/A of E-99 2,4-D ester
15 days for 1.33 pt (1 lb ai)/A of Weedone 650 2,4-D ester

2,4-D applied with glyphosate improves broadleaf weed control, reduces resistant weeds, and may antagonize grass control depending rates, formulation, and timing of application.

Plant soybean seed at least 1.5 inches deep. Planter press wheels should completely cover seed and separate seed from herbicide layer. Risk of soybean injury from preplant 2,4-D will depend on weather, rainfall, amount of weed vegetation, and previous crop residue. 2,4-D should not be applied if risk of injury and possible stand and yield loss cannot be accepted. Use only 2,4-D products registered for preplant application prior to planting soybean. Always read and follow 2,4-D label directions.

B4. Aim (carfentrazone) is a non-residual, contact herbicide, that requires thorough coverage and controls some small broadleaf weeds. Oil adjuvant increases weed control. Aim applied with glyphosate improves control of many small broadleaf weeds but the rapid contact action may antagonize control from glyphosate on larger and less susceptible weeds. Aim requires an adjuvant when applied alone. Refer to Aim label for adjuvant use when mixing with glyphosate.

B5. Autumn Super (iodosulfuron & thien carbazonone) contains two long-residual herbicides. Apply post-harvest in the fall for control of many grass and broadleaf weeds, including dandelion. Plant only corn the following spring after application. Most crops can be planted the year following the corn crop - refer to label.

B6. Dicamba is an effective and residual herbicide. Dicamba applied alone controls many broadleaf weeds but usually is applied with other herbicides such as 2,4-D, MCPA, glyphosate, and SU herbicides to reduce the rate of dicamba and increase control of wild mustard and annual and perennial broadleaf weeds.

Dicamba applied with glyphosate improves control of many annual and perennial broadleaf weeds. See label for crop rotation restrictions. Exclude months that soil is frozen.

*Or generic equivalent.

B7. DNA herbicides (Prowl*, Sonalan*, Treflan*) must be thoroughly and uniformly mixed in the top 2 to 3 inches of soil. The number of incorporation passes differ depending on formulation. For Treflan*, incorporation must be performed within 24 hours after application. Sonalan must be incorporated within 48 hours after application. Prowl incorporation may be delayed 7 days. The second incorporation of liquid DNA herbicides can be done anytime after the first, but the second incorporation of trifluralin 10G granules must be done no sooner than 5 days after the first. The second incorporation of Sonalan 10G must be done no sooner than 3 to 5 days after the first. Delay between first and second incorporation of 10G formulations allows the active ingredient to release from granules. The first incorporation is to cover the granule and the second is to thoroughly mix the soluble active ingredient in the soil. The second incorporation can also be done in the spring.

Treflan* may be fall applied for foxtail control on ground to be planted to wheat or barley the following spring. Some crop stand reduction may occur from fall applied Treflan* but generally no yield loss occurs. Granular formulations may be applied to standing stubble; liquid or granular formulations may be used when residue will not interfere with incorporation. Seed wheat or barley no more than 2 inches deep into a moist seedbed. Refer to the chemical fallow section for information on Treflan* applied in the fallow year for foxtail control in small grains the next year.

B8. Glyphosate is a non-selective, non-residual, systemic (translocated) herbicide that can be in the fall, preplant, and preemergence. Glyphosate can be applied with most herbicides labeled for fall or preplant use. However, glyphosate used multiple times per year (e.g., prior to planting, preemergence, in resistant crops, PRE-harvest, POST-harvest, in fallow fields) greatly increases the risk of weed resistance. Refer to pages 28-30, 35-39, and 106 for strategies to delay resistance. Refer to pages 90-94 for information to improve herbicide activity of glyphosate and many other herbicides.

B9. Liberty (glufosinate) is a non-selective, non-residual, contact (limited translocation) herbicide that can be applied preplant or prior to emergence of canola, corn, soybean, and sugarbeet. Apply in 15 to 30 gpa of spray volume by ground applicator and a minimum of 10 gpa of spray volume by aerial applicator. Choose nozzles and spray pressure to deliver a medium spray droplet. Large spray droplets will reduce weed control. Liberty works best during warm/hot, humid, and sunny conditions. Rate, weed height, humidity, sunlight/time of day application, and temperature affects Liberty activity. High RH significantly increases weed control. Full sunlight greatly enhances Liberty. Apply Liberty after dawn and 2 hours before dusk. Liberty should control most broadleaf weeds but may not control large tillering grasses, lambsquarters or volunteer soybean. Liberty will desiccate top-growth of biennial and perennial weeds but weeds will regrow due to limited translocation. Allow a 4 hour rainfree period after application. Apply Liberty at 32 to 43 fl oz/A with AMS at 3.0 lb/A. AMS is more critical for Liberty activity than glyphosate activity. If Liberty is applied at 32 to 43 fl oz/A preplant or prior to emergence of canola, corn, soybean, and sugarbeet, no additional Liberty may be applied during the growing season. If Liberty is applied at 32-43 fl oz/A PRE in LL canola, soybean, and corn, additional Liberty at 29-43 fl oz/A can be applied in LL corn and soybean and at 29 fl oz/A in LL canola. Residual and non-residual herbicides may be mixed with Liberty to provide additional control. The addition of dicamba and/or oil adjuvants required by tankmix herbicides may antagonize the activity of Liberty. The addition of a POST grass herbicide (clethodim) will improve control of grasses, especially perennial grasses.

B10. Facet L (quinclorac) plus MSO adjuvant controls green and yellow foxtail, barnyardgrass, cleavers/bedstraw, volunteer flax, and may suppress small kochia and Russian thistle. Facet is the most effective herbicide for field bindweed control in fallow, postharvest, and preplant in spring prior to seeding wheat including durum. Wheat and sorghum have a 0 hour plant back restriction. Apply in fall prior to a killing frost to bindweed at least 4 inches long. For best long-term bindweed control, make yearly fall applications of Facet at 22 to 32 fl oz/A. Use the higher rates for dense populations or large plants. Apply with MSO adjuvant at 1 to 1.5 pt/A plus UAN at 1 gal/A to bindweed at least 4 inches long.

B11. Paraquat* is a non-selective, non-residual, contact herbicide that can be used as a crop desiccant or as a substitute for tillage applied alone or with residual herbicides. Apply in 5 to 10 gpa by air or 10 to 20 gpa of water by ground before crop emergence. NIS will enhance paraquat more than other adjuvant types. Oil adjuvants are least effective. Other contact type herbicides can enhance paraquat activity. Paraquat may not control tall lambsquarters. Paraquat + metribuzin or Sharpen is effective for both burndown and residual weed control. 2,4-D or dicamba applied with paraquat will improve control of larger annual broadleaf weeds. However, the rapid contact action of paraquat may antagonize systemic herbicides if mixed together. The antagonism will be most pronounced on larger, less susceptible broadleaf weeds. Paraquat does not require acidification or adjustment of spray solution pH. AMS may improve paraquat activity when sprayed with high levels of hard water (>1,000 ppm hardness). Paraquat* is corrosive to aluminum spray equipment and aircraft structures requiring immediate rinsing after use. Paraquat* is toxic and can be fatal if swallowed or from excessive exposure. Avoid contact with skin. Paraquat* is a Restricted Use Pesticide (RUP).

B12. Sharpen (saflufenacil) provides contact burndown and rate dependant residual PRE broadleaf weed control in fallow and prior to planting chickpea, corn, field pea, lentil, small grain, and soybean. Sharpen at 1 fl oz/A does not provide adequate residual weed control. Refer to label for rates labeled on each crop. Apply Sharpen with MSO adjuvant at 1% v/v but no less than 1.25 pt/A + AMS at 8.5 to 17 lb/100 gal of water or UAN at 1.25 to 2.5% v/v if weeds have emerged prior to application. Apply to small weeds. Sharpen applied at water volume of 5 gpa provides less weed control compared to 10 gpa. Do not apply after crop has emerged or injury or death may result. Residual activity requires rainfall for activation. Sharpen is a PPO-inhibitor mode of action herbicide and may control weeds resistant to other herbicides. Sunflower is the most sensitive crop, more than sugarbeet. Sharpen is registered for pre-harvest desiccation of several crops. Listings on the Crop Rotation Chart do NOT include time that soil is frozen. Refer to label for tank-mix options.

*Or generic equivalent.